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SCIENCE NEWS LETTER

THE WEEKLY SUMMARY OF CURRENT SCIENCE



December 28, 1940

Giant X-Ray Unit

See Page 409

A SCIENCE SERVICE PUBLICATION

Do You Know?

Yucca flower stalks may grow 11 inches in 24 hours.

The *boundary* between Alaska and Canada is 1,541 miles long.

Twins or larger multiple births are unknown among fur *seals*.

Asbestos cloth, well preserved, was found in the ashes of old Pompeii.

Plastics are providing new decorative effects for the sides of orchestra *drums*.

Starting a new *soap* factory or expanding an old one is now forbidden in Belgium.

Germany gets 40,000 tons of *edible fats* a year from coal—but “butter” from coal is expensive.

Japan's war problems include a shortage of *industrial salt*, and industrialists plan to make caustic soda from sea water.

New *color blindness* tests compiled for the U. S. Army make this country independent of foreign tests of this type.

Renewing old attempts to use wood products as *cattle feed*, Norway is to put 100,000 metric tons of chemical pulp to this use.

Farmers and city folks are becoming more and more alike, due to the process of *suburbanization*, says a Cornell University sociologist.

QUESTIONS DISCUSSED IN THIS ISSUE

Most articles which appear in SCIENCE NEWS LETTER are based on communications to Science Service, or on papers before meetings. Where published sources are used they are referred to in the article.

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What plans are being made to observe the September eclipse? p. 409.

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CHEMISTRY

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ENTOMOLOGY

What chemical protected by public patent is deadly to the codling moth but harmless to man? p. 406.

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PHYSIOLOGY

How much whisky could our great-grandfathers drink without harming their health? p. 408.

PHOTOGRAPHY

How can three colors be recorded on two color films? p. 411.

PHYSICS

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It takes a *wild duck* 15 to 30 minutes to get dinner in a corn field mechanically picked.

A scientist classifies *ice* into six kinds, according to the amount of pressure producing each kind.

The first *reference library* in the modern sense was established in ancient Egypt, at Alexandria.

One *light* bulb of high wattage supplies more light than several small ones that total the same wattage.

A scientist sliced a loggerhead *sponge* and took a census of its tenants, finding 17,128 parasitic animals in the “hotel.”

Loud sounds such as cannon fire or volcanic explosions produce may be heard up to a distance of 300 miles.

In the search for new motor fuels, a Swedish scientist is trying a way of using crude *turpentine* in motors.

The metal-working industry of the United States has about 1,325,000 *machine tools* in use—an investment of billions of dollars.

A collection of 50,000 specimens of California *Indian culture*, ancient and modern, provides the University of California's anthropology museum with “the most extensive record of any culture in the world.”

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GENERAL SCIENCE

National Security Lessons From Human Physiology

Dr. Walter B. Cannon, Retiring President of AAAS, Points to Readiness of All Body Parts To Act Together

LESSONS for the security and stability of the nation can be learned from a study of the workings of our own bodies, Dr. Walter B. Cannon, noted Harvard University physiologist, declared in his address as retiring president of the American Association for the Advancement of Science. Dr. Cannon titled his talk, "The Body Physiologic and the Body Politic."

Security and stability, ardently desired by all thoughtful citizens and striven for by statesmen, are indispensable for the individual body, Dr. Cannon emphasized at the outset of his address. Let the body temperature drop below a certain point for even a short time, let the blood content of oxygen or its alkalinity or its sugar concentration fluctuate too far outside certain narrow boundaries, and serious consequences, even death, follow promptly. Yet so great has the unconscious wisdom of the body become in the course of millions of years of evolution that all these vital balances are automatically maintained, with never a need for directing thought on the part of the brain.

Yet, said the speaker, in addition to the regulatory arrangements which work for stability, we should recognize the significant fact that "our bodily organization is set up, as a rule, with a large margin of safety. Except in parts of the brain we are not built on a scant and skimpy plan. For example, we have two kidneys, we need only one; we carry much longer intestines than are actually required; half of the lung area, half of the thyroid gland, more than half of the pancreas can be removed without markedly altering the uniform state of the fluid matrix. When we consider the possible damage to organs by accident or disease this liberal mode of construction is obviously important for the persistence of the organism."

Another highly important factor in maintaining bodily security in an unstable world is its ability to make emergency alterations in its own "internal environment." Realization of danger causes a rise in adrenalin secretion, and this in turn a quick rise in blood sugar concen-

tration, making increased energy available for fight or flight as the situation may dictate. Against smaller foes from the world of germs the body makes its own kind of chemical warfare, with anti-toxins, or the blood recruits increased numbers of its "soldier cells," the white corpuscles.

Key positions and vital labor supplies are recognized by the body, too. In accidents, or during starvation, the most protected organs, and the last to suffer, are the directing brain and the pumping heart.

All of these bodily functions, and others as well, can be studied profitably by the physicians of our body politic, Dr. Cannon suggested. Not, he added, that the analogy should be pushed too far, comparing muscle cells to laborers, bankers to fat cells, etc. More profitable, it would seem, is to think in terms of functional balance, in state affairs as well as in bodily physiology.

Obvious to everyone, Dr. Cannon indicated, is the fact that the body politic is nowhere nearly as well coordinated as the body physiologic. Especially distressing is the lack of internal regulators in the social body. Instead of correcting drifts away from optimum conditions, our tendency as a body politic seems to be to get caught in cumulative difficulties; a run on a single bank starts runs on others, until we are in a financial panic; a period of high production is followed by a time of slump and unemployment. The body politic seems to be chronically prone to chills and fever.

In the nutritional analogy, however, things are a little more satisfactory, Dr. Cannon admitted. We have learned to store surplus food by freezing or heat-sterilizing it, so that the spoilage and waste that used to contribute to later famines have been materially reduced. He also noted with approval the economic measures recently taken by the government which allow the withholding of surpluses in fat periods, for disposal when times become leaner.

"Instant readiness for defense against dangerous and destructive enemies is also suggested by the body," Dr. Cannon continued. "We have noted that, when faced with the necessity of physical combat, almost every part of the organism is almost at once intensely aroused to defensive action and that, for gaining victory, mobilization of the (Turn to Page 408)



NEW SPEED IN PHOTOGRAPHY

Three pioneering photographers are happily trying an innovation of photography, a 1/30,000th second flash outfit that can be carried around by the photographer. Prof. Harold Edgerton is using his new equipment powered by a battery in the case that is slung from his shoulder. It will be six months or a year before this apparatus that Prof. Edgerton is testing on Dr. C. E. K. Mees is put on the market. G. W. Wheelwright, of polaroid fame, is looking on. The photograph was taken at the conference on Photography held by the Carnegie Institution of Washington in connection with their annual exhibit. Dr. Mees, vice-president and director of research of Eastman Kodak Co., answered questions about the Eastman products and how they could be more effectively used by scientists. Prof. Edgerton talked about his high speed flash technique and Mr. Wheelwright showed many of his slides that gave the impression of depth.

GEOPHYSICS

Earth's Core May Be Solid, With Hydrogen Dissolved

Study of Earthquake and Experiments With Metals Lead to Conclusion Center Is Metal Occluding Gas

MEMBERS of the clergy have long been considered authorities on the state of things below. However, their ideas of brimstone generally had no experimental data to support them.

Newest theory of the nature of the world's core comes from a Jesuit priest, Father Joseph Lynch, of Fordham University. As a physicist and director of the University's Seismograph Observatory, he has accumulated actual laboratory evidence in favor of his concept.

According to Father Lynch, the earth's core is metal in which hydrogen gas is dissolved. Such a solid solution is not as familiar as the usual liquid solution, of salt in water, for instance.

A large amount of knowledge of the inside of the earth has come from study of the travel of various kinds of waves from earthquakes. These are of two kinds. Some are longitudinal or compressional waves, in which the earth particles move forward and backward, in the same line as that in which the wave is going. Sound waves are of this type. The other kind are transverse, or "shear", waves. In these, which travel more slowly, the particles move from side to side. These are more like the waves set up by waving a long string.

The shear waves can only travel through a material that has a certain amount of rigidity, in other words, a solid. Liquids have no rigidity, and hence only the compressional waves go through them. They travel through solids also.

Earthquake experts have found both compressional and shear waves reaching recording instruments through the globe from distant tremors. From their behavior, they have learned that there is a definite core to the earth. About half its diameter—some 4,000 miles.

The compressional waves that enter this core reappear on the other side and travel to their destination, but shear waves that enter it seem to be lost. Hence, it has been supposed that this core is a liquid, an idea supported by a study of the effect of tides, which indicates that the earth's center cannot be very rigid.

In a paper issued by the Seismological

Society of America, Father Lynch calls attention to the fact that some evidence has been found that shear waves do reappear, though in greatly reduced form, after penetrating the core. This, he says, shows that the core has some rigidity and cannot be a liquid.

He performed experiments with the metal palladium, which is similar to platinum, and dissolves hydrogen readily. Its rigidity, he finds, is greatly reduced as more and more of the gas is absorbed, or occluded, as the process is called.

In his experiments he was unable to make the palladium occlude enough hydrogen to make it as slightly rigid as it would theoretically have to be in the

interior of the earth. However, he stated:

"In the core of the earth the enormous pressure would prevent such escape, and hence it is plausible to imagine a metallic core occluding an amount of hydrogen sufficient to reduce the core's rigidity practically to zero. On the basis of the present work, therefore, a solid solution is proposed as representing the state of the earth's core.

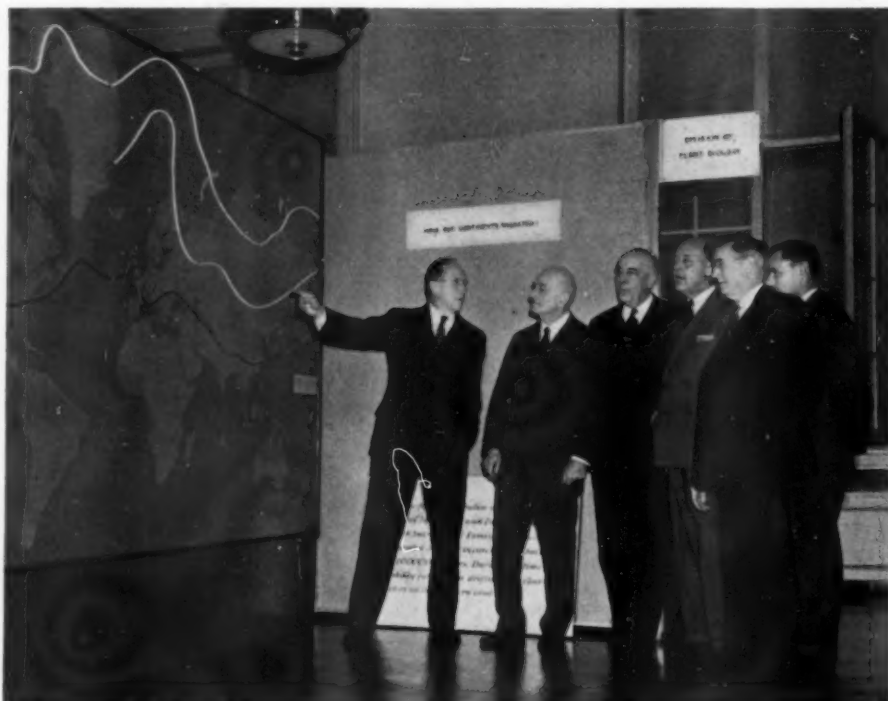
"The gas presumably would be hydrogen; the metal one of the many metals known to occlude hydrogen readily. Such a solid-solution core would have the advantage over a liquid core that it would permit feeble shear waves to pass through, as seismic investigations seem to require. It would have the advantage over a solid core that it would have the low rigidity demanded by tidal action."

Science News Letter, December 28, 1940

MEDICINE

Doctors Warned to Watch For Pneumonia-Like Disease

A NEW respiratory infection, a pneumonia-like disease which cannot be fought with sulfapyridine chemical so



CONTINENTAL DRIFT

Prof. Ralph W. Chaney, of the Carnegie Institution of Washington staff, is explaining new evidence against the theory of moving continents at the Institution's annual exhibit. To the right of Prof. Chaney are Trustees W. Cameron Forbes, Frederic A. Delano, James W. Wadsworth, and Roswell Miller. Dr. Vannevar Bush, president of the Carnegie Institution, stands in the foreground at the right. This exhibit was prepared with the cooperation of the Museum of Science and Industry of New York, where it will soon be displayed.

effective in curing ordinary pneumococcus pneumonia, is the subject for comment by the *Journal of the American Medical Association* (Dec. 21).

Because of sporadic cases and minor epidemics that have occurred in this country and abroad, the doctors of the nation through this comment are being warned to watch for this disease which has already acquired a whole series of labels. The term "acute pneumonitis" is used in the report.

Unlike ordinary pneumonias, the cause of this new disease is believed to be a virus, rather than a germ. Dr. J. M. Weir and Dr. F. L. Horsfall, Jr., of the Rockefeller Foundation, have succeeded in transmitting the disease to the wild mongoose, abundant in Jamaica. The virus was also recovered from the ill mon-

gooses and its guinea pig as the cause of the infection established by being again used to cause the disease. The mongoose was used as an experimental animal because of its resemblance to the ferret and because it can easily be obtained.

Because it resembles epidemic influenza in many respects, the new disease is of peculiar interest just now when influenza has been epidemic in some places in this country.

One striking feature of the disease is that it has a long incubation period, developing about two weeks after infection. The onset is accompanied by high fever, headache, sweating, rasping cough, little involvement of the lungs that shows up in X-rays, and the infrequency of chill or pain in the chest. Most cases are mild.

Science News Letter, December 28, 1940

some cases of gingivitis and pyorrhea," Dr. Stephan reports.

Long-term studies of patients with caries and other dental diseases are now under way. In some cases carbamide is being used as a dentrifice. Carbamide would be ineffective, however, unless there was some urease to convert it to ammonium carbonate, and not all persons may have enough of the urease-containing bacteria in their mouths to do this job effectively. So in some of the test patients, the mouth is being inoculated with harmless bacteria which contain urease. In still others, the two, the bacteria and carbamide, are being used together.

These are the tests which are expected to shed new light on the cause of tooth decay and its prevention.

Science News Letter, December 28, 1940

DENTISTRY

Discovery Gives Promise Of Dental Decay Prevention

Rinsing Mouth With Carbamide Solution Not Only Protects From Acid But Adds Calcium to the Teeth

CARBAMIDE, a common chemical known also as urea and produced in the body from proteins as well as in the laboratory, may provide the weapon for eventual conquest of tooth decay or dental caries. It may itself become this weapon and is now being tested for its caries-preventing possibilities.

Discovery that carbamide can play a role in protecting teeth against decay was made by Dr. Robert M. Stephan, of the University of Illinois College of Dentistry. (*Science*, Dec. 20.)

"These studies promise to shed new light on the causation and prevention of caries and to furnish a new treatment for gingival (gum) and periodontal diseases," Dr. Stephan declares.

Carbamide's tooth-protecting ability depends on the fact that under the action of an enzyme called urease it is converted to ammonium carbonate. The latter is able to neutralize some of the acids which might otherwise produce caries activity.

Rinsing the mouth with a solution of carbamide (synthetic urea) has been found to change the condition of bacterial material on tooth surfaces and in cavities to a more than normal degree of alkalinity. At this degree of alkalinity, calcium phosphate tends to be deposited

on the tooth from the saliva instead of being dissolved from the tooth. In other words, the teeth are not only protected from acids which take calcium out of them but are given additional amounts of tooth-building calcium, at least on their surfaces, if not within their structure.

The enzyme needed to convert carbamide to ammonium carbonate is contained in certain bacteria, such as *Staphylococcus albus* and *aureus*, which grow on the tooth surface in the bacterial plaque. These plaques also contain bacteria which have the power to ferment starches and sugars to acids which decalcify teeth and thus cause decay.

Previously it has been thought that the saliva neutralized the acid in these plaques by means of its buffers, substances which tend to lessen the effects of acidifying or alkalizing materials. Now Dr. Stephan has discovered that in addition to the buffers contained in saliva, its urea is converted by the action of certain urease-containing bacteria to the acid-neutralizing ammonium carbonate.

"Solutions of carbamide, used in conjunction with a toothbrush, have been found to be effective in cleaning teeth, and clinical observations have indicated that the treatment may be of value in

ASTRONOMY

Astronomers Find Hydrogen Gas in Cunningham Comet

HYDROGEN gas, never before recognized in a comet, has been discovered in Cunningham's comet, now visible in the western evening sky. This discovery, which radically changes the ideas of astronomers about the nature of comets, was announced here at the Harvard College Observatory, where the comet was discovered in September.

Up to now, carbon, oxygen, nitrogen and sodium have been the principal elements recognized in comets by analyses of their light. Except for the sodium, these have always been in compounds, such as carbon monoxide.

Studying one spectrum plate of the new comet, Leland E. Cunningham, discoverer of the comet, and his colleague, Dr. Fletcher G. Watson, have found dark bands that seem to show that a comet consists mostly of hydrogen.

Similar dark bands have been found in comet spectrum photographs before, though they have never been interpreted as due to hydrogen in the comet itself. It is planned to re-examine these old plates as soon as possible. With further exposures that may be made of the new comet, these may confirm the presence of hydrogen.

If it proves correct, the new discovery, said the Harvard astronomers, will be important in the interpretation of future comets. Any new clue to their birth will contribute to understanding better one of astronomy's major unsolved puzzles, the origin and evolution of the solar system.

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PHYSICS

New Invention Just Patented Makes Scene Visible By Heat

Infra-Red Telescope Might Be Used To Detect Lightless Bombing Planes By Heat From Their Exhausts

DETAILS of a new invention that may already be in use in England to detect lightless bombing planes on a dark night are revealed in a patent just issued by the United States Patent Office. Numbered 2,225,044, the patent was granted to Roscoe H. George of West Lafayette, Ind., who in turn assigned his rights to the Radio Corporation of America.

According to the specifications, the George invention will do essentially what an earlier infra-red telescope, invented by R.C.A. engineer V. K. Zworykin, accomplished, but in a much simpler manner. Dr. Zworykin's device turned the heat or infra-red rays into electrons and focussed them on a screen, which was made to glow where the electrons hit. Mr. George has found a means of avoiding the necessity of using electrons and focussing them.

Basic to his invention is the fact that certain materials, like magnesium or zinc sulfate, are made to glow, not only by electrons, but also by ultraviolet light. This consists of waves too short to be

visible. The infra-red waves are at the other extreme—they are too long to be seen.

When a screen of such material glows it is storing energy and giving it out again as light. If, while such energy is stored, infra-red rays fall upon it, the energy is given off more rapidly, and the screen glows more brilliantly where the heat waves strike.

Mr. George's device is really a reflecting telescope like that used by the astronomer. The picture becomes visible on a screen of the type mentioned. A source of ultraviolet rays floods this screen continually, so that it glows faintly. When in use, the infra-red rays from the distant airplane, or other object to be detected, are focussed on this screen by a dish-shaped mirror. Where they fall the screen becomes bright, and the picture appears.

If infra-red rays pass through fog more easily than visible light, he suggests, the device could be used in the landing of planes or the docking of ships

in fog. On the ground, or on shore, there would be infra-red beacons, and these could be seen with the device. However, a use perhaps more significant is suggested as follows:

"Furthermore, the present invention is useful in ascertaining the position of airplanes at night, particularly under fog conditions, since a certain amount of infra-red light is radiated from the exhaust manifolds of an airplane engine and this infra-red light is sufficient in intensity to make the position of the airplane visible through the use of the present invention even though the airplane itself is invisible when the present invention is not used."

For many months reports reaching the United States from England have told of a mysterious device by which the British defenses can detect airplanes in the dark, but no details have been given. Perhaps the George invention, or something similar, has been used.

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ENTOMOLOGY

Public Patent Granted On Codling-Moth Killer

DEADLIER than lead arsenate to codling moth larvae (the "worms" you sometimes find in apples) but harmless to human beings and other warm-blooded creatures, the chemical phenothiazine is now protected by a patent (No. 2,127,566) issued to L. E. Smith, U. S. Department of Agriculture, and dedicated by him to the free use of the American public.

Although it is not a new chemical, phenothiazine is new in its application as an insecticide. Mr. Smith has been working on it in this connection for six years. In 1934 he applied for a patent on its insecticidal use, but litigation with a private company which made similar claims has prevented the final issuance of the patent until recently. The chemical may now be manufactured and sold by anyone; but the Department of Agriculture advises against doing so until certain difficulties connected with its large-scale application as an orchard spray have been ironed out.

In the course of experiments to make sure of the harmlessness of phenothiazine to warm-blooded animals, there were suggestions of its possible usefulness in the treatment of certain germ diseases in human beings, but its use in this connection is still in the experimental stage. It is, however, widely used as a veterinary remedy for worms in animals.

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CENTRAL AMERICAN TREASURES

Dr. A. V. Kidder, archaeologist of the Carnegie Institution inspects his ancient pottery at the Annual Exhibit of the Carnegie Institution, Washington. These pottery works were found in the Indian mounds of Guatemala and were lent by the Guatemalan government. They were used for cosmetics and as part of the ritual of worship.

ASTRONOMY

Holiday Comet

**Look For It in West Just After Sunset Early in Month;
Two Brilliant Planets Also Brighten Evening Skies**

By JAMES STOKLEY

TO THE usual brilliant display that the stars provide in the evening skies of January, we have this month added attractions in the form of two bright planets and, early in the month, a comet.

Cunningham's comet, discovered in September, and which became easily visible to the naked eye about Christmas, is still with us. In the first week of January it is moving through the constellation of Aquila, the eagle. This group does not show on our maps, since it sets before the time for which they are prepared. However, it is easily found.

Around 6:30 or 7:00 p.m., look directly west, and you will see a bright star with a fainter one nearby on either side. The bright one is Altair, and all three are in Aquila. The comet is rapidly moving through this group. Night after night it gets brighter.

At the same time it is nearing the sun, setting sooner and sooner after the sun. By mid-January, when most brilliant, it will be lost in the sun's glare, to reappear a few weeks later in the morning sky to people in the southern hemisphere. Also, the moon, at first quarter on January 5, is getting brighter and brighter, and it will help drown out the comet by its light.

The planet Jupiter, brightest object save the moon to be seen in the evening sky just now, is high in the southwest, in Aries, the ram. Saturn, fainter, is alongside it, to the left. The moon, in a gibbous phase, passes just south of the pair on the seventh.

Stars of the evening sky are shown on the accompanying maps, as they appear at 10:00 p.m., Jan. 1, 9:00 p.m., Jan. 15, and 8:00 p.m., Jan. 31. If you look first for the three stars that form Orion's belt, with Betelgeuse above and Rigel below, both in the same group, you can quickly find the other bright orbs in this part of the heavens.

Below Orion, and a little to the left, is Sirius, the dog star, in Canis Major, the big dog. Above this is Procyon, in Canis Minor, the lesser dog, and still higher is Pollux, in Gemini, the twins. Above Orion and to the right is Aldebaran, in Taurus, the bull. Almost di-

rectly overhead is Capella, in Auriga, the charioteer. Two other first magnitude stars are Deneb, in Cygnus, the swan, low in the northwest, and Regulus, in Leo, the lion, to the east.

About 5:00 a.m., Mars, still far away and faint, rises to the southeast, and Venus, more brilliant even than Jupiter, follows about an hour later.

When you look over to the southeast these evenings, and see the brilliant Sirius, you are looking at a star that has attracted attention of men for ages. To the Egyptians it was an object of worship, called Sothis and other names.

Since it is the brightest star seen in the night-time sky, either from the northern or southern hemisphere, its fame is not surprising. However, it really is not so bright, nor as big, as it may seem. Astronomers' calculations indicate that its diameter is 1,560,000 miles, about 80% bigger than that of the sun.

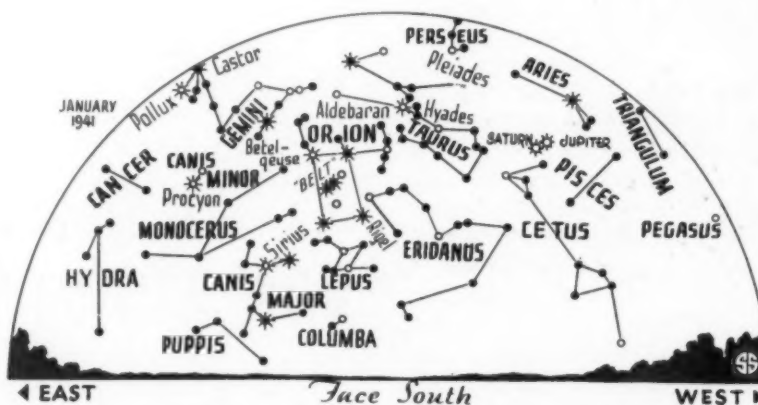
Its actual brightness, or candlepower, is about 30 times that of the sun. This may seem very brilliant, but the star Rigel, in Orion, is about 21,000 times the sun's luminosity. Rigel is 63 times as far as Sirius, and so it looks fainter.

One of the most interesting things about Sirius is its curious companion. Visible only through big telescopes, this star is called Sirius B. With Sirius A, brighter member of the pair, it performs a kind of "ring around the rosy" dance. Every 50 years the two stars make a complete circuit around a point between them.

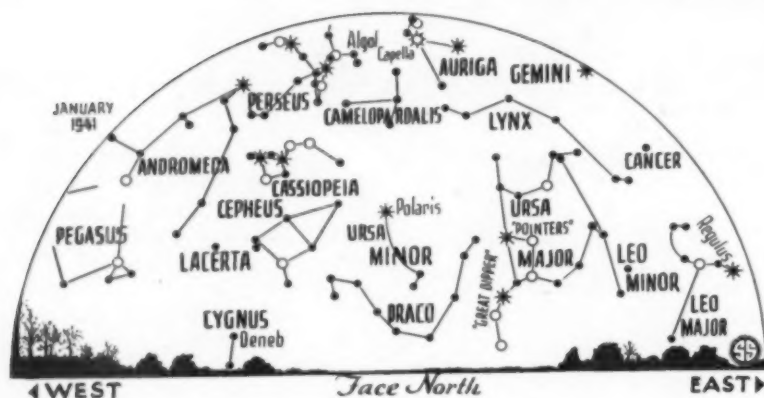
Strangest thing about Sirius B is that it contains half as much stuff as Sirius A, and about as much as the sun, concentrated into a sphere only a thirtieth the diameter of the sun, about as big as the planet Uranus. To crowd so much matter into so small a space means that it must be extremely condensed. It proves to be about 27,000 times as dense as the sun, or about 40,000 times as dense as water. That is, a pint of this star's material would weigh 20 tons! Yet this stuff is a gas, which sounds even more incredible.

The explanation given for this remarkable stuff was clearly elucidated a number of years ago by Sir Arthur Eddington, famous British astronomer who is perhaps the leading authority on the interior of the stars. On a trip to America, he said that he found his hats, shoes, and other impedimenta in the luggage took up a lot of room. If he could have chopped them up into small bits, a much smaller suitcase would have carried them all. In a similar way, he suggested, the atoms of which all matter is made take up a lot of room, but in them is a lot of empty space. In a star such as Sirius B, the enormous temperatures of a stellar interior "ionizes" these atoms—that is, they are broken into bits, and so can be compressed into a far smaller space. More recent studies seem fully to confirm Sir Arthur's suggestion.

Because they are so small, yet white in color, stars of this kind are known as white dwarfs, and during the past year many new ones have been found. Some are as much as a thousand times as dense as Sirius B, in strange contrast to a star such as Betelgeuse, in Orion. If



◀ EAST Face South WEST ▶
* * * * SYMBOLS FOR STARS IN ORDER OF BRIGHTNESS



we had a piece of this star on earth, we should call it a pretty good vacuum.

Celestial Time Table for January

Friday, Jan. 3, 1:00 p.m., Earth nearest sun—distance, 91,300,000 miles. Sunday, Jan. 5, 8:40 a.m., Moon in first quarter; 12:00 p.m., Moon farthest, distance 251,260 miles. Tuesday, Jan. 7, 2:11 a.m., Moon passes Jupiter; 7:17 a.m., Moon passes Saturn.

Friday, Jan. 10, 5:00 a.m., Saturn changes from westward to eastward movement through sky. Monday, Jan. 13, 6:04 a.m., Full moon. Thursday, Jan. 16, 1:04 a.m., Cunningham's comet nearest sun. Sunday, Jan. 19, 3:00 a.m., Moon nearest, distance 229,970 miles. Monday, Jan. 20, 5:01 a.m., Moon at last quarter. Thursday, Jan. 23, 4:48 a.m., Moon passes Mars. Saturday, Jan. 25, 3:10 p.m., Moon passes Venus. Monday, Jan. 27, 6:03 a.m., New moon.

PHYSIOLOGY

1840 Americans Could Drink Quart of Whisky a Day

Harm From Alcohol Comes From Increasing Calories In Proportion to Vitamin B₁ Intake; Diet Worse Now

THE AMERICAN of 1840 could drink nearly a quart of whiskey (29 ounces) every day and still keep his health and live to a good old age, but the average American of today cannot, Dr. Norman Jolliffe, of New York University, told the American Association for the Advancement of Science.

The immunity of our great grandfathers to the diseases of alcohol was due to their superior intake of vitamin B₁, Dr. Jolliffe explained. The vitamin deficiency that scientific study has recently demonstrated to be the real basis of the so-called alcoholic diseases, is due not so much to an absolute lack of vitamin B₁ as it is to a vitamin intake which is too low in proportion to the calories. Increasing the calories consumed by experimental animals that are getting too little vitamin B₁, only increases their liability to deficiency disease. Those that eat too few calories are safest.

The average American of drinking age today consumes more than 200 calories every day just from his alcohol in addi-

tion to the non-alcoholic calories in his drink and the calories in his food. This extra 200 calories cuts the important ratio between vitamin B₁ and calories from the alcohol-free 3.32 to 3.13. This means an 18.2 per cent reduction in the already slim margin of safety for this vitamin.

The average American of 1840 had a ratio of 7.2 and a margin of safety of 230 per cent.

It is a mistake, Dr. Jolliffe emphasized, to assume from the recent demonstration of the part of vitamin B deficiency in alcoholic diseases that alcohol itself is harmless—a mistake made by those opposed to drinking as well as those who like it. Although these diseases do unquestionably develop as a direct result of nutritional deficiency, he said, it is the consumption of too much alcohol and too little food that is responsible for the nutritional lack.

The alcohol acts in still another way to cut down the individual's ration of vitamin B₁—by irritating the intestinal tract so that food is lost or avoided.

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internal forces is likely to reach the utmost limit . . . Again observe that security is a primary objective. In a world where predatory nations, powerfully armed, are ready to attack, the ideal of security is not adequately respected. Internal forces are not trained for action. Protective instruments of warfare are lacking. At a time of crisis industry is obliged to begin to construct buildings and design tools and machines to manufacture the instruments which the crisis demands. Compare this unpreparedness with the preparedness of our bodies which through many generations of little use still retain the elaborate reactions of defense."

The physiological balance of the body would further suggest that stability is more important than economy. Excess of water or salt or sugar is thrown away when derangement of a steady state is approached. In personal and governmental practices, also, the principle of preferring security to economy has to some degree been recognized, in fields all the way from peaceful fire insurance and police departments to warlike armies and navies. These are not economical, in the narrow sense, but they are considered worthwhile because they contribute to the safety of the body politic.

The principal of the protection of the most vital organs, even at the expense of others, is observed to some extent in the body politic when national emergencies arise: we keep key men at home and exempt skilled workers and technicians from military duty, and even at the front we shelter the General Staff and the Service of Supply as much as possible.

However, lest this point be stretched in an attempt to justify dictatorships, Dr. Cannon cautioned his hearers against jumping to the conclusion that the brain is the all-dominant, and therefore the all-precious organ of the body. True, the brain can, by implementing an act of will, destroy the body by suicide and the other parts cannot save themselves. But in normal functioning, the whole body cooperates in self-direction, through the hormones or gland secretions that act with, and react upon, the brain and nervous system.

Likewise, in a democratic society, "the diffused functional groups have possibilities of continuing the life of the social organization and of controlling their own circumstances," Dr. Cannon said in conclusion. "When an arbitrary dictator seizes power these possibilities vanish . . . Experience has shown that the social body, like the human body, is integrated

by martial emotions and by preparations for conflict. A dictator, therefore, praises military powers, and rouses martial emotions by pointing to national insecurity or national destiny, and finally drives on to open aggression. Thus he obtains the

support of a unified people. But despotic domination lacks precisely what is required for continuance of despotic rule—provision for replacement by an equally despotic ruler.”

Science News Letter, December 28, 1940

HISTORY

Christmas Once Celebrated On Sixth of January

In Constantinople in Seventh Century, Date Was On What Is Now Epiphany; Candlemas Was on February 14

EVIDENCE that in the seventh century A.D., the birth of Christ was celebrated on Jan. 6, instead of the modern Christmas date of Dec. 25, has been dug out of ancient chronicles at the Catholic University of America, by Dr. Martin Higgins, a member of the University faculty. This celebration of the Feast of the Nativity on what is now known as Epiphany seems to have been the custom for some time in ancient Constantinople under the imperial successors of Constantine.

The clue to the different date was found, ironically enough, in accounts of a riot. The disturbance was caused by shortage of bread, and the angry mob threw stones at their monarch while he walked, barefoot, in a night procession commemorating the meeting of the aged

St. Simeon with the Christ-Child when he was brought to the Temple in the arms of his mother, 40 days after his birth. This riot occurred on Feb. 14, A.D. 602. Figuring backwards, this would throw the Feast of the Nativity on Jan. 6.

The same feast that caused the poor Emperor all his trouble is now celebrated as the Feast of the Purification, or Candlemas Day, on Feb. 2, when candles to be used in the church for the ensuing year are blessed. The blessing and distribution of candles in seventh-century Constantinople had a different and more direct significance, Dr. Higgins notes, since they were used immediately by the marchers in the procession as it moved through the dark streets.

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PHYSICS

Million-Volt X-Ray Unit Dedicated at G.E. Anniversary

See Front Cover

TAKING a picture through four inches of steel in less than two minutes, a job formerly requiring an hour exposure, is possible with the new million-volt X-ray outfit in the General Electric Company's Research Laboratory, at Schenectady.

This equipment made its debut before a group of scientists, journalists and industrialists who came to help celebrate the completion of 40 years of General Electric research.

Though three similar million-volt X-ray units are in use in hospitals, this is the largest to have an industrial application. Just as the physician or surgeon

is able by X-rays to look inside the body of his patient, so engineers can look into the casting from which, for example, a huge turbine will be made. Defects which might cause failure of the machine, possibly with fatal results, are detected before there is trouble. Up to now the largest industrial equipment in the world is a 400,000-volt unit, which the new apparatus supersedes.

With the 400,000-volt unit, three hours and a half were required to make a picture through five inches of steel. With the new one, only five minutes are required. The exposure time must be increased two and one-half times per inch of steel to be pictured.

The giant unit is housed in a special building of its own. Unique construction features are employed to make it the safest possible building for the operation of high-voltage X-ray equipment. For example, the walls of the structure are of solid concrete, 14 inches thick, plus 12 inches of brick on the interior, making a total thickness of nearly three feet or the equivalent of approximately four inches of lead.

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ASTRONOMY

Soviet Scientists Planning Observations of Eclipse

WHEN the tip of the moon's shadow next strokes the earth, along a path crossing Siberia and China on Sept. 21, 1941, some 200 scientists, in thirty groups at sixteen different points in Russian territory, will be making observations of the total eclipse of the sun. This is revealed in a dispatch just received from Tass, Soviet news agency.

The Soviet Academy of Sciences has set up a commission under the chairmanship of V. Fesenko, to take charge of preparations. A book in Russian and English is shortly to be published giving details of the planned observations, and a discussion of the weather probabilities in the various locations.

"The zone from which the total eclipse will be observable," Dr. Fesenko is quoted as saying, "stretches from the shores of the Caspian Sea across that sea and the Aral Sea, through the cities of Kzyl-Orda and Alma-Ata, and then on to Chinese territory. The maximum duration of the total phase of the eclipse will be about 2½ minutes.

"The mountains of Kazakhstan through which the zone of total eclipse passes offer excellent points of observation."

Among the subjects which will be studied, he said, are the Einstein theory of relativity; the sun's corona; its innermost atmospheric layer, the chromosphere; the sudden explosions in the sun that seem to cause electrical and magnetic disturbances on earth, and the zodiacal light, a glowing band sometimes observed near the sun.

To supplement the ground observations, it was announced, some astronomers will ascend high above the earth in airplanes and stratosphere balloons. These should be especially useful if clouds hamper the work of the ground parties.

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PHYSICS

Principles of Fog Formation Given Aeronautical Scientists

Heating of All Surrounding Air Is One Way; Intense Sound Another; Neither Are Practical for Airports

ON THE 37th anniversary of the Wright Brothers' first aerial flight at Kitty Hawk (December 17), members of the Institute of the Aeronautical Sciences heard of the scientific principles of fog which still forms a major handicap to aviation.

Before a meeting held at Columbia University, Dr. Sverre Petterssen, professor of meteorology at the Massachusetts Institute of Technology, gave the fourth annual Wright Brothers Lecture, on "Recent Fog Investigations."

Fog may be removed, he said, in two ways. One is by actual physical removal of the fine drops from the air; the other by evaporating them. The latter may be done if enough heat is supplied, not only to evaporate the drops themselves, but also to raise the temperature of the surrounding air. Its relative humidity is lowered, and it can accommodate the extra water vapor produced from the drops. However, heating, over a large area, such as a harbor or airport, is impracticable, he said, because the heat must be supplied uniformly over the entire region.

Another method which, he stated, has worked successfully has been to spray calcium chloride solution into the fog. This takes moisture out of the air, and reduces the humidity, so that the fog drops may evaporate at the prevailing temperature.

Among possible means for the physical removal of the drops, he cited the use of an intense sound, the waves of which

would cause the drops to coalesce into larger drops, that would fall to the ground. However, he declared, "computations indicate that it would not be practicable in natural fog." It has been used on a laboratory scale to precipitate smoke.

Hopes that infra-red rays, that is, light waves too long to be visible, could be used effectively to penetrate fog, were dashed. Belief that this was possible, he said, was due to the wrong use of a formula for light transmission through suspended particles. This only applies, he stated, when the particles are about the same size as the wavelengths of light. Since the fog particles are actually much bigger, about one six-hundredth of an inch diameter, the light waves would have to be that size, about 500 times longer than they are, in order to produce an effect. However, waves as long as this would be absorbed by the gases in the atmosphere, and no advantage would be attained.

"There is no region of the radiant energy spectrum which will penetrate fog better than visible light," declared Dr. Petterssen. "This result has been confirmed by direct measurement."

He told the scientists that minute particles, each around a twenty-five thousandth of an inch in diameter, must ordinarily be present in the air as nuclei on which the water condenses to form the fog droplets. Ordinary raindrops, he stated, are from a twenty-fifth to a sixth of an inch in diameter.

Before his lecture, the Institute gave a dinner in honor of Dr. Petterssen. Griffith Brewer, president of the Royal Aeronautical Society of Great Britain, was also a guest, and honorary chairman of the lecture.

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MEDICINE

No Danger of Shortage In World's Quinine Supply

THE WORLD'S supply of quinine, "world-wide remedy for malaria," has remained in Dutch hands, free from Nazi domination, and "no danger of a quinine shortage anywhere in the world" exists.

This reassuring statement comes from Norman Taylor, Director of the Cinchona Products Institute, Inc. (*Science*, Dec. 20.)

Prior to the Nazi invasion of Holland, on May 10, Amsterdam was the headquarters of this quinine industry. On May 14, 1940, the management of this industry was transferred by royal decree to Bandoeng, Java. Mr. Taylor explains, with the "scarcely necessary" warning to have no further communication with the former headquarters in Amsterdam, for fear such correspondence would be diverted to Nazi ends.

"Java is now the center of the world's quinine industry, where ample production is assured of both cinchona bark and manufactured quinine," Mr. Taylor states. "The latter is produced at the Bandoengsche Kininefabriek, the largest quinine factory in existence. There is thus no danger of a quinine shortage anywhere in the world."

"The quinine industry, now centralized in the Netherlands East Indies, is completely Dutch and completely determined that Holland's plight shall not be turned to Nazi advantage. That attitude also actuates those connected either with the sale of Dutch quinine here or with the research and educational program of that industry."

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PHOTOGRAPHY

New Color Process Takes Three Pictures on Two Films

One Film Records Blue, Other Takes Green and Red; Special Method Provides Way of Separating These

THREE separate photographs are taken on two films with a new color photographic process, just granted United States Patent 2,224,163. The patent is issued to Virgil B. Sease of New Brunswick and Deane R. White, of South River, N. J. Rights have been assigned to the Du Pont Film Manufacturing Company.

For any successful method of color photography it is necessary to record separately the greens, blues and reds of the original scene. By properly combining colored prints from these, the color picture is produced. One means of obtaining the set in an ordinary camera, with one exposure, is with a tripack.

This is a sandwich of three films, held closely together. The sensitive emulsions on the first and second films are in contact, and the third is immediately in back, its emulsion facing the front. Objection to this, the patent specifications state, is that "the rear film lacks detail and sharpness due to the fact that it is separated physically from the front image by at least the thickness of one emulsion support."

With the Sease-White method, there are only two films. The front one records the blues. On the rear one are coated two emulsions. The top or front one is sensitive to green, and the bottom to red. Between them is a layer of gelatine, to make possible the removal of the top one without damaging the lower.

After exposure, the two films are developed, and the first, or blue sensitive one, is placed aside. The other shows the location of the reds and greens combined, though there is no color at this stage. From this, on another film a print

is made, which is a transparent picture, resembling a lantern slide.

Then the top or green layer is bleached out, and what is left shows only the reds. Next, this is placed in contact with the film print, so that the two pictures are accurately registered. Using this combination as a negative, another print on film is made. The result shows the distribution of the greens. That is, it corresponds precisely to the original top layer, which was washed away and destroyed. This, with the other two original films, provides the set of three negatives, and the finished picture may then be printed by any one of a number of processes.

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CHEMISTRY

Water Forms Compound With Stuff It Dissolves

IDEAS of chemists that when a chemical is dissolved in water, both it and the water are unchanged were challenged by Dr. David Harker, associate in chemistry of Johns Hopkins University, as a result of experiments by him and other chemists.

Reporting to the Chemical Society of Washington, Dr. Harker showed how most inorganic compounds, that is, those which do not contain carbon, actually react chemically with water when dissolved.

Aluminum chloride, for example, breaks up into atomic fragments or ions of aluminum and chlorine when in a water solution. The aluminum ions, he has found, unite with six molecules of water, which is hydrogen and oxygen, to form a large molecule of aluminum, hydrogen and oxygen. This is a strong acid.

In the case of ordinary salt, sodium chloride, there is also a reaction, when dissolved, though it is less well defined, Dr. Harker stated.

When grease is dissolved in petroleum, he said, there is no change of either. The grease molecules mingle with the petroleum molecules, but are not different from what they are when separate.

Chemists had supposed that solutions in water were of the same sort. Therefore in studying chemical reactions between such solutions the water was almost as neglected as were the test-tubes and beakers in which the reactions took place.

This idea is wrong, and it is necessary to include the water in the reaction, Dr. Harker told the chemists.

Science News Letter, December 28, 1940

The automobile industry is very young—more than one-third of all the 80,000,000 automobiles and trucks ever produced in the United States are still in use.



IN SCIENCE

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● RADIO

Highlights of the AAAS meeting and a forecast of scientific events of 1941 will be presented by Watson Davis, director of Science Service, over the coast to coast network of the Columbia Broadcasting System, Thursday, Jan. 2, 3:45 p.m. EST, 2:45 CST, 1:45 MST, 12:45 PST. Listen in on your local station. Listen in each Thursday.

•First Glances at New Books

ZOOLOGY—EXPLORATION

CHINA'S ANIMAL FRONTIER—Clifford H. Pope—*Viking Press*, 192 p., illus., \$2.50. Something about the animals of interior China, but a great deal more about the people among whom this young American collector travelled and lived, and who brought him specimens—price subject to endless haggling with his Chinese assistant. Whether you are interested in animals or in human beings, you will find this book fascinating.

Science News Letter, December 28, 1940

MINERALOGY

MINERALS OF MARYLAND—Charles W. Ostrander and Walter E. Price, Jr.—*Natural History Society of Maryland*, 92 p., illus., 40c. Although only a pamphlet in size, this little work covers adequately the field it undertakes. It would be a fine thing if there could be a similar little book for every similar area in the Union.

Science News Letter, December 28, 1940

BOTANY—HISTORY

PERFUMES AND SPICES, Including an Account of Soaps and Cosmetics—A. Hyatt Verrill—*Page*, 304 p., illus., \$3. A book by a well-known popular author, in which plant lore and history are mingled in about equal proportions.

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MINERALOGY

MINERAL IDENTIFICATION SIMPLIFIED, A Handbook of the Minerals—Orsino C. Smith—*Wetzel Pub. Co.*, 271 p., \$3.50. A handbook for the professional mineralogist and the serious student. The first fourth of the book consists mainly of directions for making laboratory tests; the remainder, of identification tables.

Science News Letter, December 28, 1940

BIOGRAPHY

JEFFERSON—Albert Jay Nock—*Natl. Home Library Foundation*, 340 p., 75c. Among his many great accomplishments, the place of Jefferson in the beginnings of American science is apt to be overlooked. Here as a part of a readable account of the great Democrat's life and deeds is also the story of Jefferson as a pioneer in that field of human inquisitiveness that we call science.

Science News Letter, December 28, 1940

BOTANY

TEXTBOOK OF BOTANY—E. N. Transeau, H. C. Sampson and L. H. Tiffany—*Harper*, 812 p., illus., color plates, \$4.

A college textbook that is a refreshing departure from the conventional type. Emphasis on physiology and ecology helps the student to see plants as living, active things, and plant communities as kinetic entities whose existence has important contacts with his own life. No one completing a course built around this text will ever feel quite alone as he walks the woods: he will know he is surrounded by near neighbors.

Science News Letter, December 28, 1940

GENERAL SCIENCE

SYMPOSIUM ON CHARACTERISTICS OF AMERICAN CULTURE AND ITS PLACE IN GENERAL CULTURE—*American Philosophical Society*, 73 p., 50c. (Proceedings, Vol. 83, No. 4.) What was said in the American Philosophical Society's historic hall in Philadelphia on April 19, 1940, when Frederick P. Keppel, Frederick Lewis Allen, Alfred V. Kidder, Lewis Mumford, Van Wyck Brooks, Francis H. Taylor, Otto Luening and Arthur H. Compton discussed what we call culture.

Science News Letter, December 28, 1940

ENGINEERING—TECHNOLOGY

RECORDS AND RESEARCH IN ENGINEERING AND INDUSTRIAL SCIENCE—J. Edwin Holmstrom—*Chapman & Hall, London*, 302 p., 15s. How to use the accumulated technical knowledge of the world is discussed in this book of British origin, which should be of value to anyone engaged in the production, extraction, integrating, storekeeping, circulation and translation of technical information.

Science News Letter, December 28, 1940

GENERAL SCIENCE

ANNUAL REPORT OF THE BOARD OF REGENTS OF THE SMITHSONIAN INSTITUTION, for the year ending June 30, 1939—*Govt. Print. Off.*, 567 p., illus., \$1.50. As usual, in addition to the report of the activities of the Smithsonian Institution, as an appendix there are 27 significant articles presenting a cross-section of contemporary science.

Science News Letter, December 28, 1940

TECHNOLOGY

A. S. T. M. STANDARDS ON TEXTILE MATERIALS, Specifications, Tolerances, Methods of Testing, Definitions and Terms, October, 1940—Prepared by Committee D-13 on Textile Materials—*Amer. Soc. for Testing Materials*, 368 p., \$2.

Science News Letter, December 28, 1940

GENERAL SCIENCE

SCIENCE IN A CHANGING WORLD—Emmett James Cable, Robert Ward Getchell and William Henry Kadesch—*Prentice-Hall*, 666 p., illus., \$3.75. Physical sciences—machines, energy, matter, heat, weather, sound, light, electricity, chemistry, earthquakes and astronomy—are presented in considerable detail and with readable simplicity for those who are searching for information. This is a handy book to keep along side the dictionary.

Science News Letter, December 28, 1940

PSYCHOLOGY

HOAXES—Curtis D. MacDougall—*Macmillan*, 336 p., illus., \$3.50. Fantastic stories that have fooled millions of people, are brought together to show the ignorance, indifference, prejudice, and general gullibility of human beings. Many of the 400 examples of hoaxes are within the realm of science or around its fringes. Required reading for potential skeptics.

Science News Letter, December 28, 1940

LITERATURE

A TREASURY OF THE WORLD'S GREAT LETTERS—M. Lincoln Schuster—*Simon and Schuster*, 563 p., \$3.75. Among the famous letters reproduced are some in the field of science: Pierre Curie to Marie Sklodowska, Charles Darwin to A. R. Wallace, Michael Faraday to Sarah Barnard, Thomas Huxley to Charles Kingsley, Blaise Pascal to Perier, Henri Poincaré and Marie Curie to Zurich Institute, Joseph Priestley to His Neighbors.

Science News Letter, December 28, 1940

PHYSICS—MATHEMATICS

A BIBLIOGRAPHY ON ORTHOGONAL POLYNOMIALS—Report of the Committee on A Bibliography on Orthogonal Polynomials, Division of Physical Sciences, National Research Coun.; J. A. Shohat, Chairman—*National Research Council*, 203 p., \$3.

Science News Letter, December 28, 1940

GENERAL SCIENCE

SCIENCE ON PARADE—A. Frederick Collins—*Appleton-Century*, 314 p., illus., \$3. Chapters on astronomy, aviation, chemistry, electricity, health, light, music, photography, radio facsimile, synthetic speech and television give pertinent details of recent advances in science. Many diagrams.

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